Supplementary Information for

Unique Role of Ionic Liquid in Microwave-assisted Synthesis of Monodisperse Magnetite Nanoparticles

Hengyao Hu,[a] Hao Yang[a], Peng Huang,[a] Daxiang Cui,*[a] Yanqing Peng,[b] Jingchang Zhang,[c] Fengyuan Lu[d] and Jie Lian,[d] Donglu Shi*[a,e]

Experimental Section

Synthesis of Fe_3O_4 magnetite nanoparticles: [$Fe(acac)_3$] (1.77 g, 5 mmol) was added to a magnetically stirred mixture of dibenzyl ether (30 ml) and [bmim][BF_4] (1.5 ml), followed by oleic acid (3.39 g, 12 mmol) and 1,2-hexadecanediol (5.17 g, 20 mmol). The sealed vial was microwaved (Discover S-class, CEM, USA) at 220 °C for 5 min; then at 250 °C for another 5 min. The microwave power was 200W at the beginning. As the temperature reached 220°C, the microwave power was fluctuated (by the instrument) to ensure that the reaction was taking place between 220 ℃ and 250 ℃. After being cooled to room temperature, the resulting mixture was diluted with absolute ethanol and the desired product was separated magnetically. It could be redispersed into hexane without size-selection process.

Characterization

The size and morphology of synthesized samples were investigated both with transmission electron microscopic (TEM, Model JEM-2010, 200 KV) and high-resolution transmission electron microscopy (HRTEM, Model JEOL 2100F, 200 KV) respectively. The shape and size distributions of the nanoparticles were obtained from the TEM images in which more than 300 nanoparticles were included. X-ray diffraction (XRD) patterns were recorded on a Rigaku Dmax-r C X-ray diffractometer using Cu Ka ration (λ = 1.540 A°), operating at 40 KV and 100 mA. Magnetic measurements for the dry magnetic nanoparticles were carried out with a Quantum design superconducting quantum interface device (SQUID) magnetometer (Model PPMS-9，USA) at 300K and 10K. From the hexane dispersions, the nanoparticles were deposited on an amorphous carbon-coated copper grid for TEM and HRTEM. Samples for XRD and SQUID were prepared by drying the precipitation of the dispersions through the freeze drying process.

Scheme S1 Synthesis scheme of magnetite nanoparticles using ionic liquids as surfactant-like and microwave heating agents.

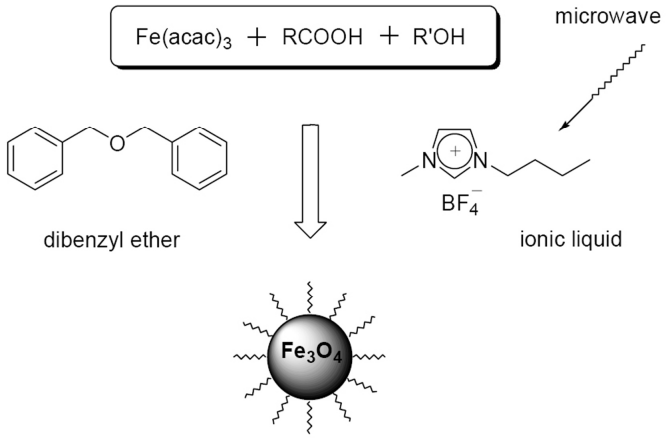
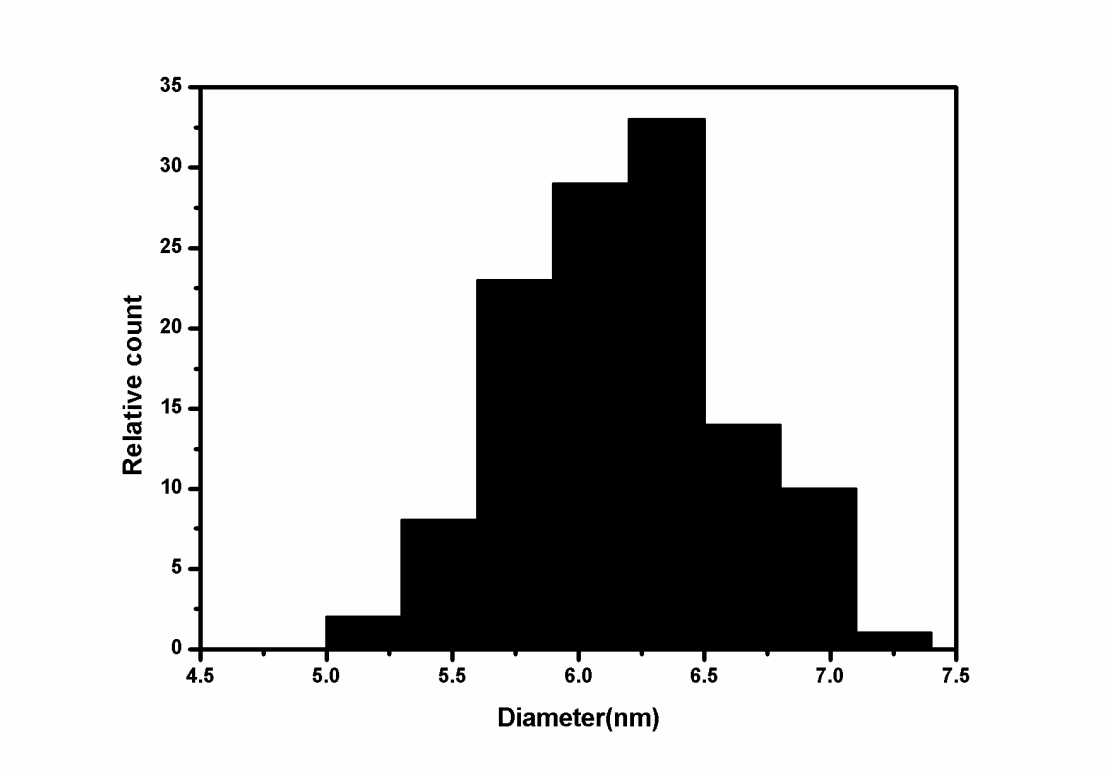


Fig. S1 Particles size distribution histograms of magnetite nanoparticles



Average diameter=6.09 nm
Size variation=±0.22 nm (±3.6%)

Fig. S2 The standard JCPDS files (a) (39-1346) for Fe_2O_3 (b)(24-0081) for γ-Fe_2O_3 and (c) XRD pattern of Fe_3O_4 nanoparticles synthesized by typical process.